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CALORIMETRIC STUDY OF THE GAS PHASE PRODUCTION OF HYDRINOS

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Introduction

In an effort to test the hypothesis that hydrinos are created during gas phase reactions between K+ ions and H-atoms, HPC recently built a new style energy cell. The cell consists of the following elements: i) a potassium and hydrogen impregnated nickel wire (on the order of 3 meters in length), ii) a three-legged quartz mandrel about 30 cm long and 2 cm across, iii) a sealed quartz tube large enough to accommodate the quartz mandrel, iv) a reservoir of water large enough to easily accept the quartz tube, v) a 'constant power' power supply, vi) a system for evacuating the quartz tube and measuring pressure, and vii) a method of measuring the change in temperature of the water reservoir. Final assembly is simple. The impregnated nickel wire is wrapped around the mandrel. The mandrel/wire is then placed in the sealed tube. The wire is attached to the power supply via vacuum feedthroughs, and the tube attached to a vacuum pump. Finally, the quartz tube is placed totally inside the well insulated water reservoir. Operation consists of the following sequence: i) evacuate the quartz tube, ii) apply constant power (order of 30-60 watts/meter) to the wire, iii) measure the temperature of the insulated water bath as a function of time.

The underlying theory of operation is that passing current through the wire will heat it, and consequently lead to the generation of gaseous hydrogen atoms and K+ ions in the vicinity of the wire. At sufficiently low pressures (ca. 1 Torr) the lifetime of these two species will be sufficiently long that a catalytic reaction between the two can take place leading to the formation of hydrinos.

The analysis of data is also simple. The rise in the water temperature is correlated to the power input. Given the heat capacity of water, and the measured constant power input to the wire it is a simple matter to determine the predicted (by conventional theory) temperature increase of the water bath. In the event that the temperature rise of the water bath exceeds that predicted by conventional theory, a new explanation is required. Either some extraordinary chemistry must be postulated and explained, or one can conclude the production of 'excess heat' provides strong support for the R. Mills Hydrino theory.

Excess heat was measured on several occasions by workers at HPC employing the cell described above. In fact, they reported instances in which heat output from the cell exceeded electrical energy input by a factor of more than four.

In an effort to verify/duplicate the HPC success, a system with all the elements described above was built in our laboratory at PSU. The only significant design changes were i) to increase the size of the water bath (to 60 liters) and add a mechanical stirrer, and ii) to employ a fine gradation (0.1 K) mercury thermometer to track the temperature rise. The first change was made in order that the instrument could track the expected excess heat over many hours of operation. One criticism of the HPC system was that the water reservoir was so small that large temperature increases forced 'shut-down' of the experiments after relatively short time periods (e.g. one hour). The system we built is capable of operation for ten to twenty hours even with five hundred watts of net energy input. The use of precision mercury thermometers was dictated by the finding that in practice thermocouple readings tend to fluctuate by more than one degree over time periods of hours. The precision mercury thermometers are simply more reliable.

Experiment

The system built in our laboratory is similar to the one described in the Introduction (see Figure 1). Reliable data has repeatedly been obtained. Data from three experiments is attached. The reliability of the data obtained in the three cases shown demonstrates the quality/sensitivity of the calorimeter, as the levels of power are far lower than those originally anticipated. Indeed, we hope at some point in time to reliably measure power outputs in the 500 watt range for many hours.

The power density in the three cases is very different. Figure 2 was run with a power density of approximately 40 W/m, which is close to the values reported to produce excess heat by HPC. In contrast, Figures 3 and 4, were run at lower power densities.

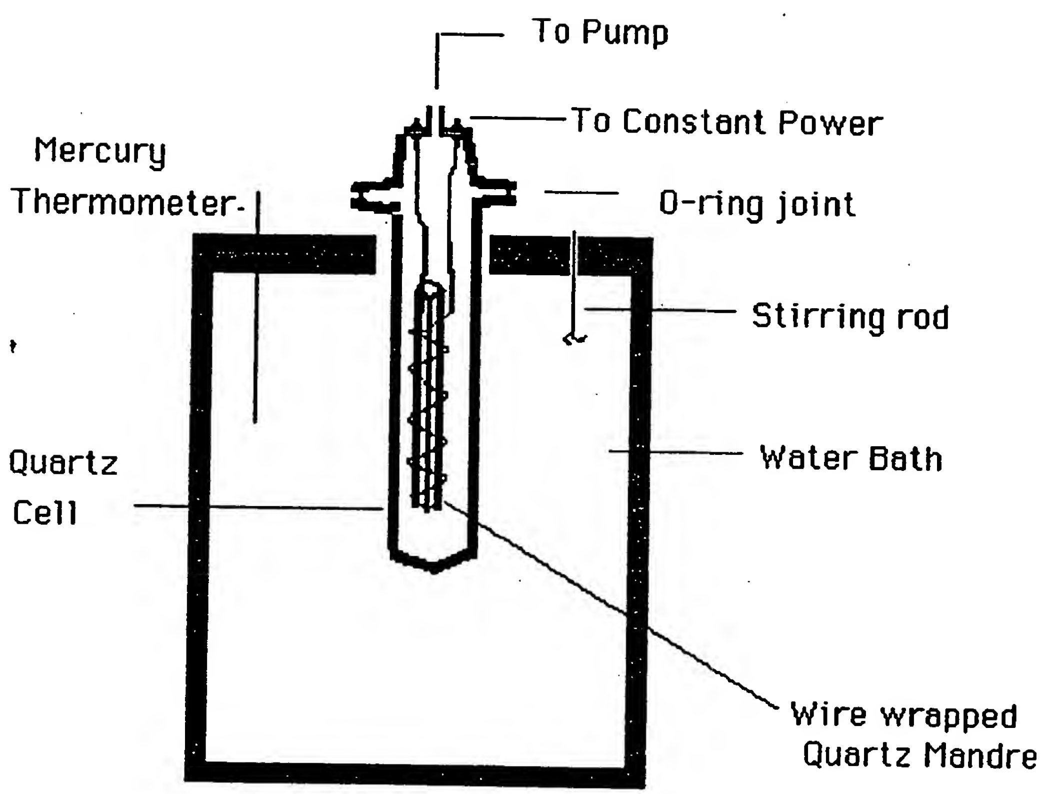
Figures 2 and 4 illustrate examples in which predicted (based on input power) temperature rise and measured temperature rise were in near perfect agreement for periods of ten hours. Figure

3 is a case in which there is an offset. Initially, the temperature did not increase. After the temperature started to increase the rate of increase agreed with that expected from conventional computations. There are a number of possible explanations for the 'slow start'; however, none of them involve the production of excess heat. The failure of one experiment to produce predicted temperature rise does include one important lesson. Excess heat will need to be produced repeatedly before the experiment can be considered conclusive. Moreover, the greater the deviation from anticipated behavior, the more compelling the results will be.

Future Work

Two thrusts are planned for the future. First, additional wires will be constantly tested with the new calorimeter. This work will begin in earnest after the completion of a new constant power supply, which can reliably deliver on the order of 150 DC volts to the low resistance/high current wires we are employing. Simultaneously, work will be carried out using the Calvet calorimeter described in earlier reports.

Figure 1


To Pump
To Constant Power
Mercury
Thermometer
O-ring joint
Stirring rod
Water Bath
Quartz
Cell
Wire wrapped
Quartz Mandrel

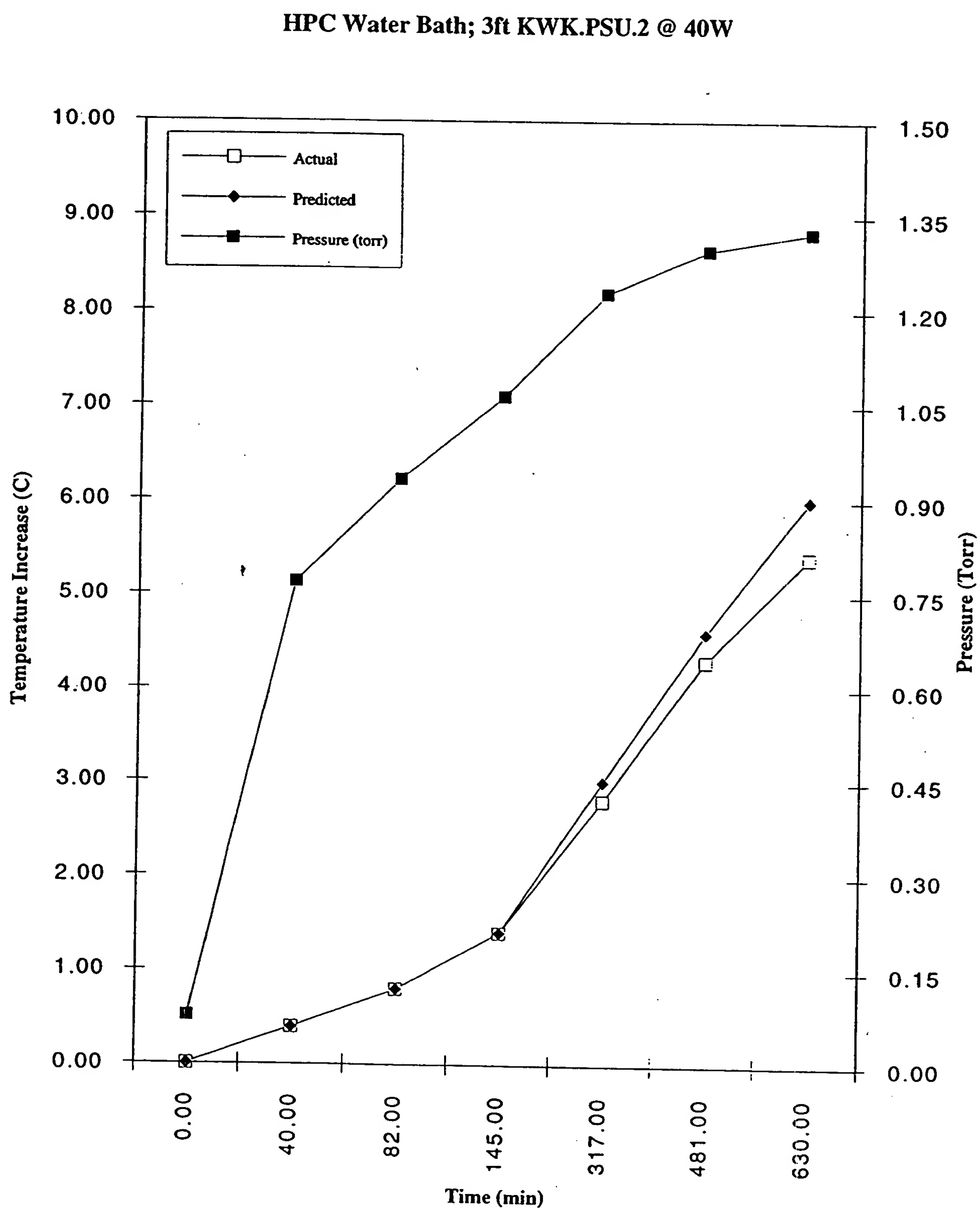

HPC Water Bath; 3ft KWK.PSU.2 @ 40W
Actual
Predicted
Pressure (torr)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Temperature Increase (C)
1.50
1.35
1.20
1.05
0.90
0.75
0.60
0.45
0.30
0.15
0.00
Pressure (Torr)
0.00
40.00
82.00
145.00
317.00
481.00
630.00
Time (min)

Figure 2

HPW Water Bath; 10ft KWK.PSU.3 @ 25W

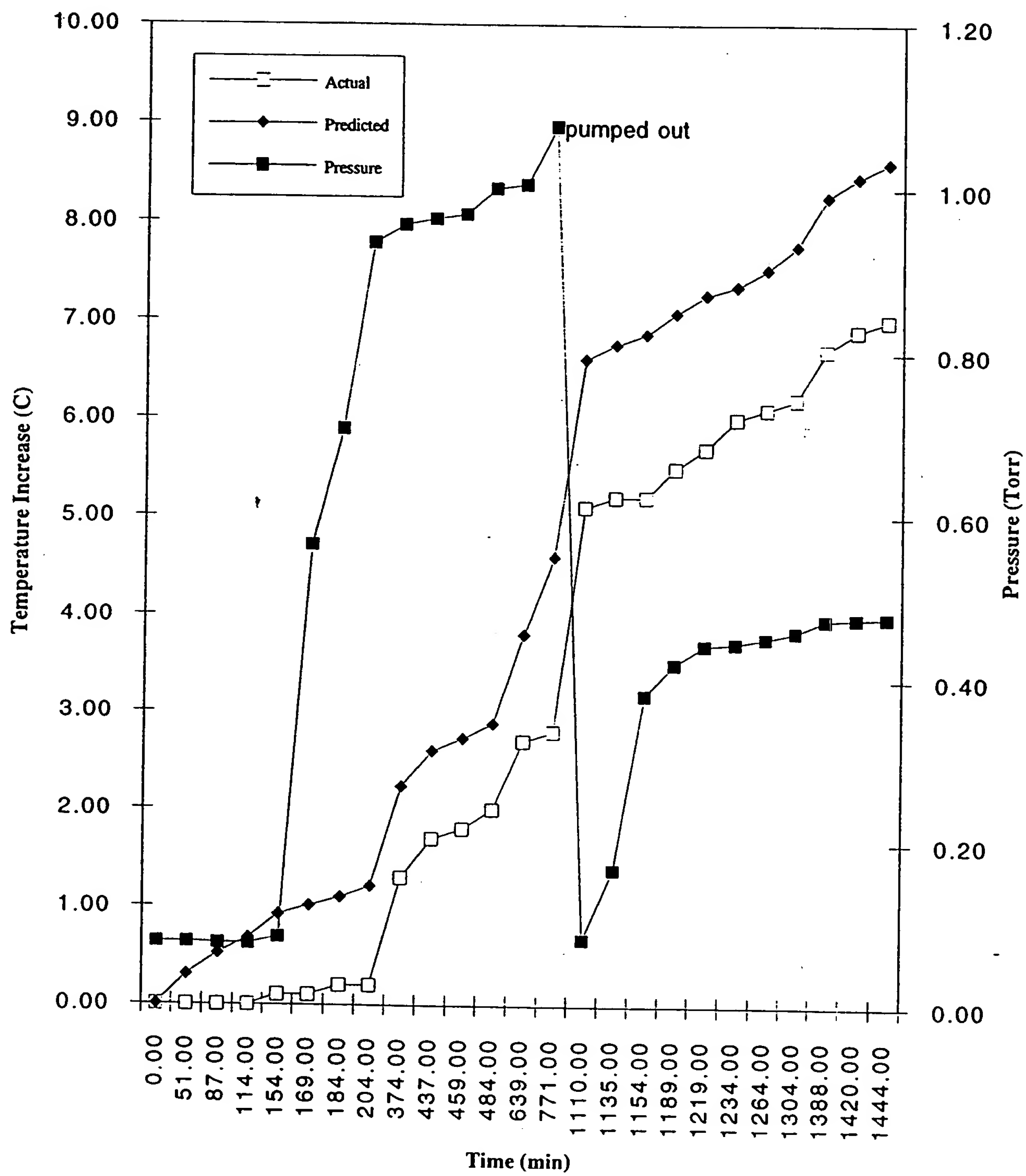


Figure 3

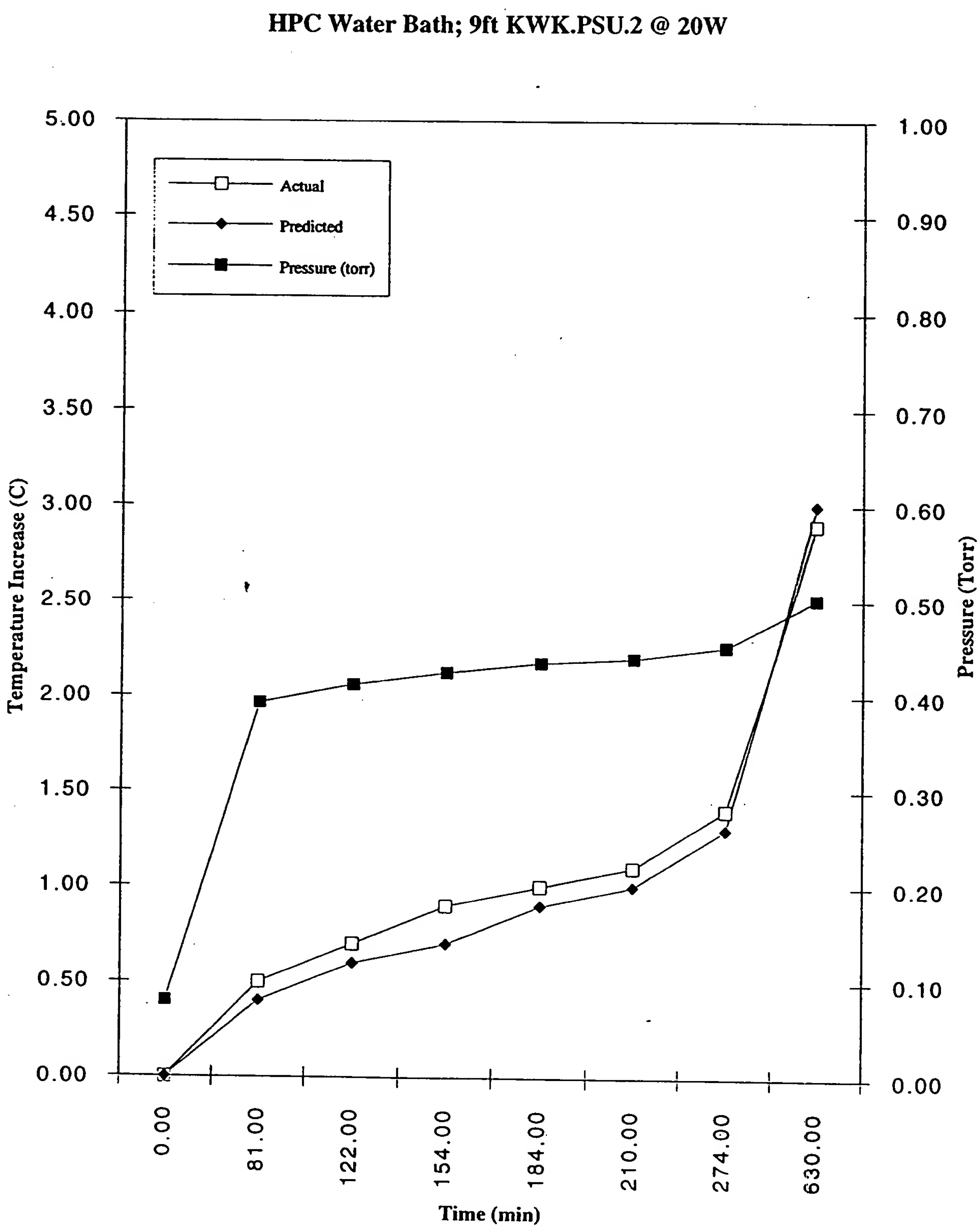

HPC Water Bath; 9ft KWK.PSU.2 @ 20W
Actual
Predicted
Pressure (torr)
Temperature Increase (C)
Pressure (Torr)
Time (min)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
81.00
122.00
154.00
184.00
210.00
274.00
630.00

Figure 4